IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Applicant	:	Mark S. Andreaco	
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Examiner	:	Otilia Gabor	
Docket No.	:	24017.03	
Customer No.	:	22465	
Assignee	:	CTI PET Systems, Inc.	
Title	:	Scintillation Detector Array for Encoding the Energy, Position and Time Coordinates of Gamma Ray Interactions	
Express Mail	:	EV 744992887 US	

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P. O. Box 1450
Alexandria VA 22313-1450

APPEAL BRIEF

Sir:

This Appeal Brief is filed on behalf of the Applicant in the above-referenced patent application in response to Paper Number 20051115 mailed on December 1, 2005. It is deemed to place the application in a condition for allowance.

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I. Real Party in Interest

This appeal is taken on behalf of CTI PET Systems, Incorporated, having a principal place of business at 810 Innovation Drive, Knoxville, Tennessee, 37932. CTI PET Systems, Inc., is the owner of record of the Application. All of the inventors have assigned their rights to CTI PET Systems, Inc., and the assignments have been recorded with the United States Patent and Trademark Office.

II. Related Appeals and Interferences

There are no other appeals or interferences known by Appellants or Appellants' legal representative that will directly affect, be directly affected by, or have a bearing on the Board's decision in the pending appeal.

III. Status of Claims

Claims 1 to 50 are presently pending in the Application. None of the claims have been amended. Claims 1, 17, 23, and 38 are independent claims. Claims 2-16 depend, either directly or indirectly, from Claim 1. Claims 18-22 depend, either directly or indirectly, from Claim 17. Claims 24-37 depend, either directly or indirectly, from Claim 23. Claims 39-50 depend, either directly or indirectly, from Claim 38. For reference, a statement as to the status of each Claim prosecuted in the present application is presented:

Claim 1 (original) ..... Rejected 103(a)
Claim 2 (original) ..... Rejected 103(a)
Claim 3 (original) ..... Rejected 103(a)
Claim 4 (original) ..... Rejected 103(a)
Claim 5 (original) ..... Rejected 103(a)

Claim 6 (original) ..... Rejected 103(a)
Claim 7 (original) ..... Rejected 103(a)
Claim 8 (original) ..... Rejected 103(a)
Claim 9 (original) ..... Rejected 103(a)
Claim 10 (original) ..... Rejected 103(a)
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Claim 12 (original) ..... Rejected 103(a)
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Claim 14 (original) ..... Rejected 103(a)
Claim 15 (original) ..... Rejected 103(a)
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Claim 17 (original) ..... Rejected 103(a)
Claim 18 (original) ..... Rejected 103(a)
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Claim 33 (original) ..... Rejected 103(a)
Claim 34 (original) ..... Rejected 103(a)
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Claim 47 (original) ..... Rejected 103(a)
Claim 48 (original) ..... Rejected 103(a)
Claim 49 (original) ..... Rejected 103(a)
Claim 50 (original) ..... Rejected 103(a)

A copy of Claims 1-50, as presently before the United States Patent and Trademark Office, is set forth in Appendix A.

Claims 1, 15, 17, 23 and 38 are specifically analyzed in response to the examiner's rejections. Claims 1, 17, 23 and 38 are the independent claims in the application as originally filed and as now presented. It is respectfully submitted that a finding of patentability of such claims will render all claims in the present application patentable.

IV. Status of Amendments

There have been no amendments to the claims entered in the Application on Appeal.

V. Summary of the Claimed Subject Matter

The invention detailed in the Claims of the present Application is a scintillation detector array for encoding energy, position and time coordinates of gamma ray interactions for use in Positron Emission Tomography (PET) imaging. Independent Claims 1, 17, 23 and 38 are involved in the present appeal.

A. Independent Claim 1

The subject matter of independent Claim 1 includes a scintillation detector array for encoding energy, position and time coordinates of gamma ray interactions for use in Positron Emission Tomography imaging. The scintillation detector array includes a plurality of discrete scintillator elements which interact with incident gamma-rays to produce a quantifiable number of scintillation photons. Each of the plurality of discrete scintillators is composed of a first layer having a first selected decay time and a second layer having a second selected decay time. The first selected decay time is not equal to the second selected decay time. Further, the first layer is composed of a first selected scintillator material and the second layer is composed of a second selected scintillator material. The first and second selected scintillator materials are stacked one upon the other, whereby a pulse shape discrimination technique is used to determine which said layer the gamma ray interacts. See pages 15, line 10 through page 25, line 5, and Figs. 3a-3l, 4-4b, 5, 6-6b, 7 and 8, which describe and illustrate various embodiments of such an array. Scintillators **140** and **240** comprise the first and second layers, respectively, of the plurality of discrete scintillators.

An optical detector **25** is associated with each of the plurality of discrete scintillator elements and positioned for sensing and quantifying scintillation photons exiting each of the plurality of discrete scintillator elements. This is as introduced at page 14, line 18, and illustrated first in Fig. 2a.

A continuous light guide **50** having first and second planar surfaces is disposed between the plurality of discrete scintillator elements **140,240** and the associated optical detectors **25** for distributing scintillation photons exiting the plurality of discrete scintillators to the associated optical detectors. The light guide is introduced at page 15, line 14, and illustrated in Fig. 3a.

A means operatively associated with the scintillation detector array is provided for determining time, energy, depth and transverse and longitudinal position coordinates of gamma ray interactions in the plurality of discrete scintillator elements. Such means are electronic circuitry as set for at page 26, line 7, through page 32, line 9, and illustrated in Figs. 16-20.

B. Independent Claim 17

Independent Claim 17 includes the subject matter claimed in independent Claim 1 and further includes the limitation that the first and second layers of scintillator materials are High-Z. This is disclosed, for example, at page 18, lines 19-20.

C. Independent Claim 23

Independent Claim 23 includes the subject matter claimed in independent Claim 17 and further includes the limitation that the continuous light guide is optically bonded to the plurality of discrete scintillator elements. This is disclosed, for example, at page 14, lines 22-24 and illustrated in Fig. 2a.

D. Independent Claim 38

Independent Claim 38 includes the subject matter claimed in independent Claim 1 and further includes the limitation that the plurality of discrete scintillator elements, which interact with incident gamma rays to produce a quantifiable number of scintillation photons, is arranged in an (m) times (n) array, and the plurality of optical detectors is arranged in a (q) times (p) array, wherein the (m) times (n) array does not equal the (q) times (p) array and further wherein the plurality of optical detectors is for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements. This is disclosed, for example, at page 14, lines 18-22, and illustrated in Figs. 2a-2e, 3a, 3b, 4-4b, 5, 6-6b, 7 and 8.

VI. Grounds of Rejection to be Reviewed on Appeal

The examiner made the following rejections in the present application, each of which is to be reviewed on appeal.

The examiner rejected Claims 1-5, 8-11, 14, 16-20, 22, 38, 46-48 and 50 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Letters Patent No. 5,319,204, issued to Wong, in view of U.S. Letters Patent No. 3,919,556, issued to Berninger, and further in view of U.S. Letters Patent No. 5,753,917, issued to Engdahl.

The examiner rejected Claims 6, 7, 12, 13, 17, 23-35, 37 and 39-45 under 35 U.S.C. § 103(a) as being unpatentable over Wong, Berninger and Engdahl, and further in view of U.S. Letters Patent No. 6,060,713, issued to Skillicorn *et al.*, and U.S. Letters Patent No. 5,521,378, issued to Roscoe *et al.*

The examiner rejected Claims 15, 21, 36 and 49 under 35 U.S.C. § 103(a) as being unpatentable over Wong, Berninger and Engdahl as applied to claims 15, 21 and 49, and

over Wong, Berninger, Engdahl, Skillicorn and Roscoe as applied to claim 36 and further in view of U.S. Letters Patent No. 6,087,663, issued to Moisan *et al.*

VII. Argument

A. Rejections under 35 U.S.C. §112, first paragraph

There are no rejections for any presently pending Claim under 35 U.S.C. §112, first paragraph.

A. Rejections under 35 U.S.C. §112, second paragraph

There are no rejections for any presently pending Claim under 35 U.S.C. §112, second paragraph.

B. Rejections under 35 U.S.C. §102

There are no rejections for any presently pending Claim under 35 U.S.C. §102.

C. Rejections under 35 U.S.C. §103

The Law of Obviousness

35 U.S.C. §103(a) reads:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

35 U.S.C. §103(a) (2004).

A rejection under 35 U.S.C. § 103(a) must be supported by a *prima facie* case of obviousness. MPEP § 2142. Section 2143 of the Manual of Patent Examining Procedure summarizes the standards for a *prima facie* case of obviousness under 35 U.S.C. §103. The first element is that "there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings." MPEP § 2143. The second element is that "there must be a reasonable expectation of success." *Id.* The third element is that "the prior art reference (or references when combined) must teach or suggest all the claim limitations." *Id.* The expectation of success and the motivation to combine the references "must both be found in the prior art, not in the applicants disclosure." *In re Vaeck*, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

"There are three possible sources for a motivation to combine references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art." *In re Rouffet*, 47 U.S.P.Q.2d 1453, 1457-58 (Fed. Cir. 1998) (The combination of the references taught every element of the claimed invention, however without a motivation to combine, a rejection based on a *prima facie* case of obvious was held improper); *see* MPEP § 2143.01. "Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability--the essence of hindsight." *In re Dembiczak*, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999).

The standard of review applied to findings of fact is the "substantial evidence" standard under the Administrative Procedure Act (APA). *See In re Gartside*, 203 F.3d 1305,1315,53 U.S.P.Q.2d 1769,1775 (Fed. Cir. 2000); *see also* MPEP 2144.03, pg. 2100-136, 8th ed., rev. 2. There must be some form of evidence in the record to support an assertion of common knowledge. *See In re Lee*, 277 F.3d 1338, 1344-45, 61 U.S.P.Q.2d

1430, 1434-35 (Fed. Cir. 2002); *In re Zurko*, 258 F.3d 1379, 1386, 59 U.S.P.Q.2d 1693, 1697 (Fed. Cir. 2001); *see also* MPEP 2144.03, pg. 2100-137, 8th ed., rev. 2. "With respect to core factual findings in a determination of patentability, however, the Board cannot simply reach conclusions based on its own understanding or experience -- or on its assessment of what would be basic knowledge or common sense. Rather, the Board must point to some concrete evidence in the record in support of these findings." *In re Zurko*, 258 F.3d 1379, 1386, 59 U.S.P.Q.2d 1693, 1697 (Fed. Cir. 2001).

The United States Supreme Court has held that the relevant facts for finding obviousness relate to (1) the scope and content of the prior art, (2) the level of ordinary skill in the field of the invention, (3) the differences between the claimed invention and the prior art, and (4) any objective evidence of nonobviousness such as long felt need, commercial success, the failure of others, or copying. *Graham v. John Deere Co.* 148 U.S.P.Q. 459, 467 (U.S. 1966). The *Graham* Court stated that "the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved." *Id.* at 467. The *Graham* court further stated that "[s]uch secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy." *Id.*

1. *Claims 1-5, 8-11, 14, 16-20, 22, 38, 46-48 and 50*

a) Examiner's Rejection

With respect to Claims 1-5, 8-11, 14, 16-20, 22, 38, 46-48 and 50, in the Examiner's second non-final Office Action the Examiner states:

3. Claims 1-5, 8-11, 14, 16-20, 22, 38, 46-48, 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong (U. S. Patent 5319204) and Berninger (U. S. Patent 3919556) and further in view of Engdahl (U. S. Patent 5753917).

Wong discloses an apparatus and method for position and energy determination of scintillation events caused by gamma rays when used in a variety of PET scanning systems, the apparatus comprising:

- a plurality of polished scintillation crystals 12 arranged in an array 16, where each array 16 may include a matrix of 8 x 8 crystals. The array is configured to occupy one quadrant of the adjacent array of

- photomultipliers 14 (14a-14d). The crystals 12 may be of any type (example BGO) and may be cut from a large block of scintillation material or can be formed from separate crystals.

When incident gamma rays interact with the scintillation elements a quantifiable number of scintillation photons are produced, the relative energies of which are recorded by the array of photomultipliers, the corresponding signals processed and analyzed, and the X and Y position coordinates of the scintillation event determined (i.e. the crystal in which the event occurred is determined). In this case (i.e., in the reference) the number of photomultiplier arrays (i.e. (p x q)) is less than the number of scintillation crystal arrays (m x n), however the conventional prior art techniques use one detector for every scintillation crystal and thus (p x q) equals (m x n).

Wong et al. [sic] fails to disclose a continuous light guide positioned between the scintillation elements and the photomultiplier, however one of ordinary skill in the art would have been motivated to use a continuous light guide since as Berninger shows having a continuous light guide 15 optically bonded with a glass plate 11a to the output face of the scintillator 11 and the photomultiplier tube array 12 will provide an optically transparent medium to satisfy the linearity and the position resolution of the gamma camera and will also provide a refractive index match between the scintillator and the detector, a feature necessary to decrease spurious light scattering.

Wong fails to disclose that the scintillator crystal is composed of two different layers having different decay times where a pulse shape discrimination technique is used to determine the layer in which the gamma event occurred.

Engdahl discloses a scintillating camera which, performs high and low energy imaging in conventional PET applications where the camera includes:

- a scintillation crystal 12 assembly having a first layer 14 of Thallium doped Sodium Iodide NaI(Ti) with a first decay constant and a second layer 16 of CsI(Na) with a slower decay constant
- a photomultiplier tube array 22 for detecting and localizing (x, y, z positions and energy) the scintillation events within the layers of the crystal
- a glass light guide 24 and
- detection circuitry 26 for detecting, discriminating (energy and pulse height), localizing and counting the scintillation events in the crystal 12. Incoming background rays are discriminated against on the basis of the signal amplitude.

One of ordinary skill in the art at the time the invention was made would have been motivated to use the scintillation crystal with multiple layers of Engdahl in the gamma camera of Wong since as Engdahl shows having a stacked layer configuration doubles the sensitivity of detecting a single photon when single photon imaging is used and quadruples the sensitivity of coincidence detection.

This rejection is virtually identical to the rejection made by the Examiner in the first, Non-Final Office Action, Paper Number 20040616.

b) Appellants' Argument

It is respectfully submitted that the Examiner has not shown any teaching, suggestion or motivation to modify Wong's PET camera so as to include a light pipe configured in the manner taught by Berninger. In this regard, the Examiner states that one skilled in the art would have been motivated to use a continuous light guide as taught by Berninger so as to provide "an optically transparent medium to satisfy the linearity and the position resolution of the gamma camera and will also provide a refractive index match between the scintillator and the detector, a feature necessary to decrease spurious light scattering." See Page 3 of the Office Action.

Wong discloses "a plurality of crystals **12** arranged in an array **16**. Each array may comprise of numerous crystals arranged in a matrix. As an example, each array may include at least sixty-four crystals arranged in an 8x8 matrix. Each array **16** of crystals **12** can be configured to occupy one quadrant of four adjacent light detectors or PMTs **14**. Each PMT **14** can thereby be placed adjacent four adjacent quadrants of four respective arrays **16**. Each array quadrant is selected from four different arrays. The resulting crystal/PMT configuration ensures that edges **26** of each array **16** are not immediately adjacent to the PMT edges **28**. The edges between PMTs and the edges between crystal arrays **16** are therefore offset from each other to allow a single PMT to detect light from each of four crystal arrays.

"Crystals **12** may be of any suitable type, such as BGO crystals, and a suitable light detector **14** may be a photomultiplier tube or silicon photodiode. Each crystal may be cut from a large crystal ingot of scintillation material. The resultant crystal can be tested to ensure its compatibility with adjacently placed crystals so that the performance of the resulting array is consistent throughout the array and between adjacent arrays. The separate crystals can be selectively coupled (i.e., glued or banded) together with substantially no gaps therebetween to form a block or array of crystals." *Col. 5, lines 13-39.*

The Examiner agrees that Wong fails to disclose a continuous light guide positioned between the scintillation elements and the photomultiplier. Paper No. 20050117, at 3. Further, the Examiner agrees that Wong fails to disclose that the scintillator crystal is composed of two different layers having different decay times where a pulse shape discrimination technique is used to determine the layer in which the gamma event occurred. *Id.*

Berninger discusses the elements of a prior art Anger camera (U.S. Letters Patent No. 3,011,057). Berninger described the Anger camera as follows:

"Gamma rays, indicated by the arrow, and emitted by a patient undergoing nuclear medical examination, are collimated in a suitable collimator **10** which may be typically be a parallel hole collimator fabricated of lead. The collimated gamma rays are then absorbed by a scintillator **11** which is typically formed of a single crystal of sodium iodide in the form of a disk of thin dimension in the order of one half inch thickness and 13 inch diameter. The pulse of light resulting from each scintillation event in scintillator **11** is viewed by a hexagonal close packed array [sic] 12 or 19 3-inch diameter photoelectric tubes having overlapping fields of view. The phototube output signals are resolved by a simple analog computer **13** to provide electrical signals proportional to the *x* and *y*-axis coordinates of the scintillation event, and to the energy of the absorbed gamma ray. The latter information provides the gamma camera with an energy resolving capability. The processed electrical signals are displayed on a suitable read-out or image-display device **14** such as a conventional storage oscilloscope from whose face a photograph may be taken, if desired." *Col. 3, line 52 - Col. 4, line 6.*

Referring to the Berninger patent at col. 7, lines 4-32, it is clear that the addition of the light pipe medium 15 is not only the "major structural distinction" between that invention and Anger, but it is also necessitated by the use of convex photocathodes. Specifically, that paragraph states in part:

"A major structural distinction between the prior art gamma camera ... and my invention ... is in the light pipe medium **15** utilized between the output face of the scintillator **11** and the photocathodes of the phototube array **12**. ... [I]n my invention the primary function of the light pipe is simply that of providing a refractive index match between the glass backing of the scintillator and the glass envelope of the phototubes. Thus, the input or scintillator end of my light pipe member **15** ... has a flat surface whereas the output end has a plurality of concave depressions conforming to the outer surfaces of the convexly curved phototube glass faceplates."

The Anger camera includes a scintillator cover disk **39** that is spaced apart from the phototubes. The cover disk does not engage the phototubes as described by Berninger. On the contrary, optical fluid fills the volume defined between the phototubes and the cover disk. Accordingly, the conforming configuration of the Berninger light pipe essentially mirrors the function of the optical fluid used by Anger.

Engdahl teaches "a dual purpose scintillation camera having a scintillation crystal composed of two layers. When performing conventional nuclear imaging of low energy radioisotopes, only the first of the two layers is utilized for detection. However, in the performance of high energy photon imaging (such as 511 keV imaging), the combined thickness of both layers is utilized to effectively double the sensitivity of the camera.

As shown in FIG. 1, the imaging camera **10** according to one embodiment of the present invention contains a scintillation crystal **12** having a first layer **14** composed of NaI(Tl) and a second layer **16** composed of CsI(Na). The scintillation camera further includes a collimator **18** for collimating photons incident on the crystal, a lead shielding device **20**, an array of photomultiplier tubes **22** for detecting and localizing scintillation events within the crystal, and a glass lightpipe **24** on which the photomultiplier tubes are mounted. Additionally, detection circuitry **26** is included for detecting, discriminating, localizing and counting scintillation events in the crystal assembly **12**."

"Such a crystal assembly is sometimes referred to as a 'phoswich' crystal, from 'phosphorescence sandwich.' Such a phoswich crystal has been known per se, but has been used in significantly different applications." *Col. 3, lines 3-27.*

Referring to the Berninger patent at col. 7, lines 4-32, it is clear that the addition of the light pipe medium 15 is not only the "major structural distinction" between that

invention and the prior art relative thereto, but it is also necessitated by the use of convex photocathodes. Specifically, as cited above, that paragraph states in part:

> A major structural distinction between the prior art gamma camera ... and my invention ... is in the light pipe medium **15** utilized between the output face of the scintillator **11** and the photocathodes of the phototube array **12**. ... [I]n my invention the primary function of the light pipe is simply that of providing a refractive index match between the glass backing of the scintillator and the glass envelope of the phototubes. Thus, the input or scintillator end of my light pipe member **15** ... has a flat surface whereas the output end has a plurality of concave depressions conforming to the outer surfaces of the convexly curved phototube glass faceplates.

The prior art specifically referred to is that of Anger, disclosed in US Letters Patent No. 3,011,057. (*see* col. 1, lines 31-25 and col. 3, lines 48-51) The Anger camera includes a scintillator cover disk **39** that is spaced apart from the phototubes. The cover disk does not engage the phototubes as described by Berninger. On the contrary, optical fluid fills the volume defined between the phototubes and the cover disk. Accordingly, the conforming configuration of the Berninger light pipe essentially mirrors the function of the optical fluid used by Anger. In the Wong patent, the scintillator crystals and PMTs are cooperatively configured such that the crystals may be placed proximate the surface of the PMTs with little or no space therebetween. See, for example, Figs. 7 and 8 inserted below wherein the crystals and PMTs each define planar surfaces and wherein the crystals are disposed adjacent the input of the PMTs. Thus, while Berninger replaces the optic fluid of Anger with a conforming shaped glass light pipe, Wong has removed the optic fluid and simply moved the crystals to be

adjacent the PMTs. Berninger and Wong each moved away from Anger in opposite directions.

It can be extrapolated that the element Berninger adds to the combination with Wong is a light pipe having an output surface configured to conform to the geometric configuration of the "sensitive" ends of the photo detectors. However, such element has not been claimed in the present invention.

As seen in the figures reproduced below and as discussed above, Wong does not utilize convexly curved photocathodes as taught by Berninger, collimators as taught by Berninger, or optic fluid as taught by Anger. Thus, one skilled in the art has no motivation to modify Wong's PET camera in the manner asserted by the Examiner.

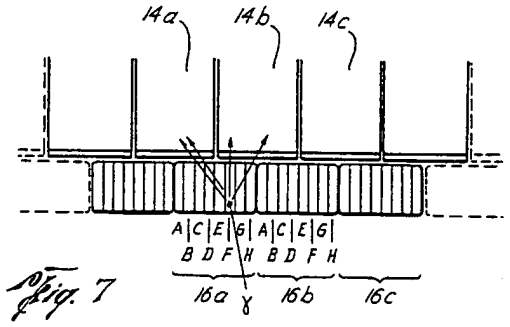


Fig. 7

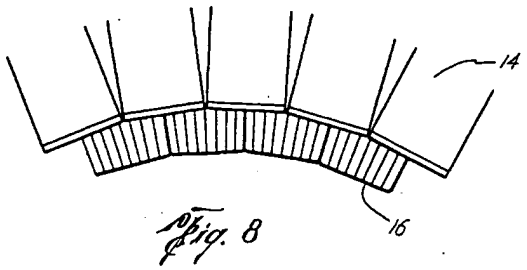


Fig. 8

Figs. 7 & 8, U.S. Patent No. 5,319,204

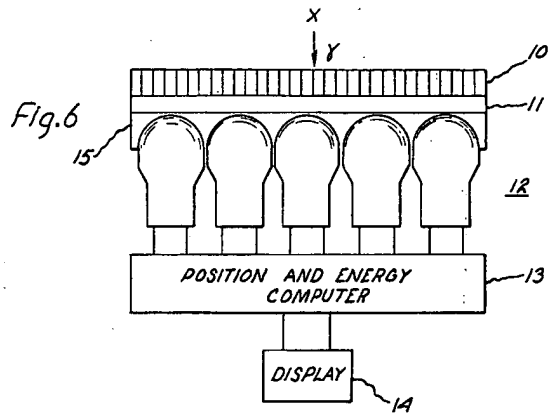


Figure 6 U.S. Patent No. 3,919,556

Moreover, Wong fails to teach the use of a light guide. In this regard, Wong states that "Figure 8 illustrates a plurality of arrays or blocks **16** of crystals **12** placed adjacent a plurality of PMTs **14**." Wong, Col. 7, lines 42-43. If one were to combine the teachings of Wong (using PMTs with planar input surfaces) with Berninger (including a light pipe having an output surface defining an array of concave surfaces), one would then be faced with a configuration somewhat analogous to that in Anger wherein a void would be created between the light pipe and the detectors, which would then be presumably filled with an optic fluid. In view of such, it is respectfully submitted that there would be no likelihood of success in making such a combination. At the very least, because there would necessarily be a further combination with Anger in order to make the Wong/Berninger combination succeed, the present invention lacks the element of an optic fluid, thereby supporting the conclusion that the Wong/Berninger combination is not obvious. Thus, again it is respectfully submitted that there is no motivation to modify Wong in the manner asserted by the Examiner.

The Examiner continued with respect to Engdahl stating that the '917 patent discloses "a scintillation crystal ... assembly having a first layer ... with a first decay constant and a second layer ... with a slower decay constant...." However, Engdahl

fails to disclose an assembly wherein each of the first and second layers of scintillation crystals defines "a plurality of discrete scintillator elements" as claimed in the present invention. On the contrary, Engdahl specifically discloses the use of a collimator "for collimating photons incident of the crystal... ." Engdahl fails to discuss any alternative embodiments, and specifically whether the use of a collimator creates inefficiencies that might be overcome by replacing the collimator with a scintillator array including a plurality of discrete scintillator elements.

The crystal assembly employed by Engdahl is not new to that disclosure. As discussed at col. 3, lines 24-27, such an assembly is referred to as a "phoswich" crystal and has been used in significantly different applications. Even with its prior use in various other applications, and then with the use by Engdahl, there has not been disclosed the assembly of the present invention until this invention. It is respectfully submitted that there has been ample opportunity for those skilled in the art to have accomplished the present invention. However, such has not been accomplished until the present invention, and it is only obvious now by hindsight, after the present invention has been disclosed. Because it had not been previously taught, it is respectfully submitted that there has been no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the cited prior art to achieve the present invention. Nor has there been a reasonable expectation of success of such combination.

It is respectfully submitted, then, that the cited references do not teach, suggest or disclose the motivation to combine the references in the manner suggested by the Examiner. The Examiner has not offered any contrary evidence to that provided by Appellants. Accordingly, Appellants respectfully submit that the Examiner has not satisfied the first element of a *prima facie* case of obviousness because the Examiner has

not shown that there is a suggestion or motivation to modify Kroening to store "a date and a point source activity level in a non-volatile memory" as required in Claim 1.

Appellants respectfully submit that the Examiner has not satisfied the first element of a *prima facie* case of obviousness because the Examiner has not shown that there is any suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. The Examiner has not shown that there is any suggestion or motivation to combine the teachings of Wong with the teachings of Berninger and Engdahl. Accordingly, Appellants respectfully request that the rejection of Claims 1-5, 8-11, 14, 16-20, 22, 38, 46-48 and 50, of the Application be withdrawn and the Examiner instructed to prepare a Notice of Allowance.

The second element of a *prima facie* case of obviousness requires that there be a reasonable expectation of success in modifying one reference by another. As stated above, Wong fails to teach the use of a light guide. In this regard, Wong states that "Figure 8 illustrates a plurality of arrays or blocks **16** of crystals **12** placed adjacent a plurality of PMTs **14**." Wong, Col. 7, lines 42-43. If one were to combine the teachings of Wong (using PMTs with planar input surfaces) with Berninger (including a light pipe having an output surface defining an array of concave surfaces), one would then be faced with a configuration somewhat analogous to that in Anger wherein a void would be created between the light pipe and the detectors, which would then be presumably filled with an optic fluid. In view of such, it is respectfully submitted that there would be no likelihood of success in making such a combination. At the very least, because there would necessarily be a further combination with Anger in order to make the Wong/Berninger combination succeed, the present invention lacks the element of an optic fluid, thereby supporting the conclusion that the Wong/Berninger combination is not obvious.

Appellants respectfully submit that the Examiner has not satisfied the second element of a *prima facie* case of obviousness because the Examiner has not shown that there is a reasonable expectation of success in modifying Wong by Berninger and Engdahl to produce a device with all the elements of Claim 1.

With respect to the omnibus rejections made by the Examiner, Appellants point to the rejections by the Examiner. While a number of claims were rejected, the Examiner related the prior art only to those limitations found in Claim 1. As such, the limitations of Claims 2-5, 8-11, 14, 16, 18-20, 22, 46-48 and 50, as well as some limitations of independent Claims 17 and 38, were not referenced by the Examiner in her rejection.

The MPEP provides guidance to examiners in rejecting claims. The MPEP states that omnibus rejections should be avoided. MPEP § 707(d), pg. 700-113, 8th ed., rev. 1. Further, the MPEP states: "A plurality of claims should never be grouped together in a common rejection, unless that rejection is equally applicable to all claims in the group." *Id.* This is in keeping with the goal of examination, which is "to clearly articulate any rejection early in the prosecution process so that the applicant has the opportunity to provide evidence of patentability and otherwise reply completely at the earliest opportunity." MPEP § 706, pg. 700-17.

The MPEP states that the "Office action should clearly communicate the Office's findings and conclusions, articulating how the conclusions are supported by the finding." MPEP 2144.08 (III). Further, the MPEP states that

> the [examiner's] findings should clearly articulate which portions of the reference support any rejection. Explicit findings on motivation or suggestion to select the claimed invention should also be articulated in order to support a 35 U.S.C. 103 ground of rejection. *Dillon*, 919 F.2d at 693, 16 USPQ2d at 1901; *In re Mills*, 916 F.2d 680, 683, 16 USPQ2d 1430, 1433 (Fed. Cir. 1990). Conclusory statements of similarity or motivation,

without any articulated rationale or evidentiary support, do not constitute sufficient factual findings.

MPEP 2144.08 (III).

In her rejection, the Examiner has not addressed each and every limitation individually to show that the elements and limitations are disclosed in the references as required to establish a *prima facie* case of obviousness. Because of the Examiner's omnibus rejection, Appellants are placed in the position of not knowing the specific grounds of rejection for each claim and can only respond by arguing the patentability of each claim individually.

Because the Examiner has applied an omnibus rejection to all of Claims 1-5, 8-11, 14, 16-20, 22, 38, 46-48 and 50 and not addressed each Claim individually, Appellants have not been afforded a reasonable opportunity to clearly understand the Examiner's rejection of each Claim and reply accordingly to overcome those rejections.

2. *Claims 6, 7, 12, 13, 17, 23-35, 37 and 39-45*

a) Examiner's Rejection

With respect to Claims 6, 7, 12, 13, 17, 23-35, 37, 39-45, in the Examiner's second non-final Office Action the Examiner states:

> 4. Claims 6, 7, 12, 13, 17, 23-35, 37, 39-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong and Berninger and Engdahl and further in view of Skillicorn et al. (U. S. Patent 6060713) and Roscoe et al. (U. S. Patent 5521378).
>
> Wong fails to disclose that the scintillator elements are being composed of the specific materials claimed, however, as Skillicorn et al. shows, the preferred scintillators in a nuclear imaging camera are the high-Z Cerium-doped Lutetium Oxyorthosilicate and Cerium-doped Yttrium Oxyorthosilicate scintillator elements and thus one of ordinary skill in the art at the time the invention was made would have been motivated to use either one, since it has been held to be within the general

skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of design choice. *In re Leshin,* 227 F.2d 197, 125 USPQ 416 (CCPA 1960).

Also, as Roscoe et al. shows scintillator materials such as Thallium-doped Sodium Iodide and Cerium-doped Gadolinium Oxyorthosilicate are commonly used in the art of gamma ray detection and thus one of ordinary skill in the art at the time the invention was made would have been motivated to use either one, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of design choice. *In re Leshin,* 227 F.2d 197, 125 USPQ 416 (CCPA 1960).

This rejection is virtually identical to the rejection made by the Examiner in the first, Non-Final Office Action, Paper Number 20040616.

b) Appellants' Argument

Appellants' argument with respect to the combination of the Wong, Berninger and Engdahl references is stated above with respect to the rejection of Claims 1-5, 8-11, 14, 16-20, 22, 38, 46-48 and 50. It is respectfully submitted that the same arguments apply to the additional combination of Skillicorn *et al.*, and Roscoe *et al.*, with respect to the subject claims to the extent that each of the rejected claims 6, 7, 12, 13, 17, 23-35, 37, 39-45 each include all of the limitations of Claim 1.

The Examiner has not shown any teaching, suggestion or motivation to modify Wong's device to include the various elements of Berninger, Engdahl, Skillicorn *et al.*, or Roscoe *et al.*

Appellants respectfully submit that the Examiner has not satisfied the first element of a *prima facie* case of obviousness because the Examiner has not shown that there is any suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. The Examiner has not shown that there is any

suggestion or motivation to combine the teachings of Wong with the teachings of Berninger, Engdahl, Skillicorn *et al.*, and Roscoe *et al.* Accordingly, Appellants respectfully request that the rejection of Claims 6, 7, 12, 13, 17, 23-35, 37, 39-45, of the Application be withdrawn and the Examiner instructed to prepare a Notice of Allowance.

The second element of a *prima facie* case of obviousness requires that there be a reasonable expectation of success in modifying one reference by another. Arguments with respect to the reasonable expectation of success with respect to the combination of the Wong, Berninger and Engdahl patents are stated above. It is respectfully submitted that by adding the Skillicorn *et al.*, and Roscoe *et al.* references to this combination does not further the expectation of success of such combination.

Appellants respectfully submit that the Examiner has not satisfied the second element of a *prima facie* case of obviousness because the Examiner has not shown that there is a reasonable expectation of success in modifying Wong by Berninger, Engdahl, Skillicorn *et al.*, and Roscoe *et al.*, to produce a device with all the elements of either of Claims 6, 7, 12, 13, 17, 23-35, 37 and 39-45. Accordingly, Appellants respectfully request that the rejection of the claims of the Application be withdrawn and the Examiner instructed to prepare a Notice of Allowance.

With respect to the omnibus rejections made by the Examiner, Appellants point to the rejections by the Examiner. While a number of claims were rejected, the Examiner related the prior art only to those limitations found in several of the Claims so rejected. As such, the limitations of all rejected claims were not referenced by the Examiner in her rejection. Some or all limitations of at least Claims 24-26 and 37 have not been specifically addressed by the Examiner. None of the claims has been specifically discussed in relationship to which reference(s) the Examiner considers to obviate the same.

In her rejection, the Examiner has not addressed each and every limitation individually to show that the elements and limitations are disclosed in the references as required to establish a *prima facie* case of obviousness. Because of the Examiner's omnibus rejection, Appellants are placed in the position of not knowing the specific grounds of rejection for each claim and can only respond by arguing the patentability of each claim individually.

Because the Examiner has applied an omnibus rejection to all of Claims 6, 7, 12, 13, 17, 23-35, 37 and 39-45 and not addressed each Claim individually, Appellants have not been afforded a reasonable opportunity to clearly understand the Examiner's rejection of each Claim and reply accordingly to overcome those rejections.

3. *Claims 15, 21, 36 and 49*

a) Examiner's Rejection

With respect to Claims 15, 21, 36 and 49, in the Examiner's second non-final Office Action the Examiner states:

> 5. Claims 15, 21, 36, 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong, Berninger and Engdahl as applied to claims 15, 21 and 49, and over Wong, Berninger, Engdahl, Skillicorn and Roscoe as applied to claim 36 and further in view of Moisan et al. (U. S. Patent 6087663).
>
> Wong utilizes a non-active light guide in the imaging gamma camera and thus he fails to use an active light guide, however one of ordinary skill in the art at the time the invention was made would have been motivated to replace the non-active light guide with an active one since as Moisan et al. shows having active light guides capable of encoding transverse and longitudinal coordinates of light emissions reduces the need of having separate scintillation elements and light guides connected to the detector array.

This rejection is virtually identical to the rejection made by the Examiner in the first, Non-Final Office Action, Paper Number 20040616.

b) Appellants' Argument

Appellants' argument with respect to the combination of the Wong, Berninger and Engdahl references is stated above with respect to the rejection of Claims 1-5, 8-11, 14, 16-20, 22, 38, 46-48 and 50. Appellants' argument with respect to the combination of the Wong, Berninger, Engdahl, Skillicorn *et al.*, and Roscoe *et al.*, references is stated above with respect to the rejection of Claims 6, 7, 12, 13, 17, 23-35, 37 and 39-45. It is respectfully submitted that the same arguments apply to the additional combination of Moisan *et al.*, with respect to the subject claims to the extent that each of the rejected claims 15, 21, 36 and 49 each include all of the limitations of Claim 1.

Examiner has not shown any teaching, suggestion or motivation to modify Wong's device to include the various elements of Berninger, Engdahl, Skillicorn *et al.*, Roscoe *et al.*, or Moisan *et al.*

Appellants respectfully submit that the Examiner has not satisfied the first element of a *prima facie* case of obviousness because the Examiner has not shown that there is any suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. The Examiner has not shown that there is any suggestion or motivation to combine the teachings of Wong with the teachings of Berninger, Engdahl, Skillicorn *et al.*, Roscoe *et al.*, and Moisan *et al.* Accordingly, Appellants respectfully request that the rejection of Claims 15, 21, 36 and 49 of the Application be withdrawn and the Examiner instructed to prepare a Notice of Allowance.

Appellants respectfully submit that the Examiner has not satisfied the second element of a *prima facie* case of obviousness because the Examiner has not shown that there is a reasonable expectation of success in modifying Wong by Berninger, Engdahl,

Skillicorn *et al.*, Roscoe *et al.*, and Moisan *et al.*, to produce a device with all the elements of either of Claims 15, 21, 36 and 49. Accordingly, Appellants respectfully request that the rejection of the claims of the Application be withdrawn and the Examiner instructed to prepare a Notice of Allowance.

With respect to the omnibus rejections made by the Examiner, Appellants point to the rejections by the Examiner. While a number of claims were rejected, the Examiner related the prior art only to those limitations found in several of the Claims so rejected. As such, the limitations of all base claims from which the rejected claims depend were not referenced by the Examiner in her rejection. Some or all limitations of at least Claims 17, 23 and 38, from which claims 21, 36 and 49 directly depend, respectively, have not been specifically addressed by the Examiner. None of the claims has been specifically discussed in relationship to which reference(s) the Examiner considers to obviate the same.

In her rejection, the Examiner has not addressed each and every limitation individually to show that the elements and limitations are disclosed in the references as required to establish a *prima facie* case of obviousness. Because of the Examiner's omnibus rejection, Appellants are placed in the position of not knowing the specific grounds of rejection for each claim and can only respond by arguing the patentability of each claim individually.

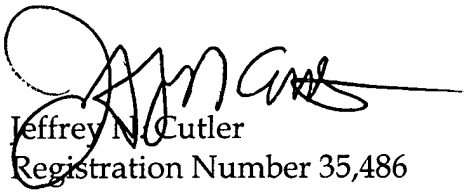
Because the Examiner has not addressed all of the elements of each claim individually, Appellants have not been afforded a reasonable opportunity to clearly understand the Examiner's rejection of each Claim and reply accordingly to overcome those rejections.

VIII. Conclusion

Appellants respectfully request that the Board overturn the rejections of Claims 1-5, 8-11, 14, 16-20, 22, 38, 46-48 and 50 under 35 U.S.C. § 103(a) as being unpatentable over Wong in view of Berninger and further in view of Engdahl; Claims 6, 7, 12, 13, 17, 23-35, 37 and 39-45 under 35 U.S.C. § 103(a) as being unpatentable over Wong in view of Berninger and Engdahl, and further in view of Skillicorn *et al.*, and Roscoe *et al.*; and Claims 15, 21, 36 and 49 under 35 U.S.C. § 103(a) as being unpatentable over Wong in view of Berninger, Engdahl, Skillicorn *et al.*, and Roscoe *et al.*, and further in view of Moisan *et al.*, and remand the Application to the Examiner with instructions to issue a Notice of Allowance.

Please charge any additional fees associated with this communication, or credit any overpayment, to Deposit Account No. 16-1910.

Respectfully submitted,



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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl No.	:	10/779,596	**Confirmation No.** 8117
Applicant	:	Mark S. Andreaco	
Filed	:	02/13/2004	
TC/A.U.	:	2878	
Examiner	:	Otilia Gabor	
Docket No.	:	24017.03	
Customer No.	:	22465	
Assignee	:	CTI PET Systems, Inc.	
Title	:	Scintillation Detector Array for Encoding the Energy, Position and Time Coordinates of Gamma Ray Interactions	
Express Mail	:	EV 744992887 US	

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Commissioner for Patents
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APPEAL BRIEF
APPENDIX A—LISTING OF CLAIMS

The following listing includes all the claims presently before the Patent and Trademark Office.

Claim 1 (original): A scintillation detector array for encoding energy, position and time coordinates of gamma ray interactions for use in Positron Emission Tomography imaging, said scintillation detector array comprising:

a plurality of discrete scintillator elements which interact with incident gamma-rays to produce a quantifiable number of scintillation photons, wherein each of said plurality of discrete scintillators is composed of a first layer having a first

selected decay time and a second layer having a second selected decay time, wherein said first selected decay time is not equal to said second selected decay time, and further wherein said first layer is composed of a first selected scintillator material and said second layer is composed of a second selected scintillator material and wherein said first and second selected scintillator materials are stacked one upon the other, whereby a pulse shape discrimination technique is used to determine which said layer the gamma ray interacts;

an optical detector associated with each of said plurality of discrete scintillator elements and positioned for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements;

a continuous light guide having first and second planar surfaces disposed between said plurality of discrete scintillator elements and said associated optical detectors for distributing scintillation photons exiting said plurality of discrete scintillators to said associated optical detectors; and

a means operatively associated with said scintillation detector array for determining time, energy, depth and transverse and longitudinal position coordinates of gamma ray interactions in said plurality of discrete scintillator elements.

Claim 2 (original): The scintillator detector array of claim 1 wherein said first and said second layers are composed of High-Z scintillator materials.

Claim 3 (original): The scintillation detector array of Claim 1 wherein said plurality of discrete scintillator elements, which interact with incident gamma-rays to produce a quantifiable number of scintillation photons, is arranged in an (m) x (n) array, and said plurality of optical detectors is arranged in an (q) x (p) array, wherein said plurality of optical detectors is for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements.

Claim 4 (original): The scintillator detector array of claim 3 wherein said (m) x (n) array equals said (q) x (p) array.

Claim 5 (original): The scintillator detector array of claim 3 wherein said (m) x (n) array does not equal said (q) x (p) array.

Claim 6 (original): The scintillator detector array of claim 2 wherein said first and said second layer of each of said plurality of discrete scintillator elements is composed of LSO.

Claim 7 (original): The scintillator detector array of claim 2 wherein said High-Z scintillator material is selected from a group consisting of LSO, LYSO, LGSO, GSO, LuAP, and YAP.

Claim 8 (original): The scintillator detector array of claim 2 wherein said first layer is composed of a first selected scintillator material and said second layer is composed of a second selected scintillator material.

Claim 9 (original): The scintillator detector array of claim 8 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for separating low and high energies.

Claim 10 (original): The scintillator detector array of claim 8 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for determining depth of interaction of the gamma rays with said plurality of discrete scintillator elements.

Claim 11 (original): The scintillator detector array of claim 8 wherein said first selected scintillator material and said second selected scintillator material are

selected for use in techniques for distinguishing pulse heights of gamma ray interactions.

Claim 12 (original): The scintillator detector array of claim 1 wherein said first selected scintillator material is YSO and said second selected scintillator material is a High-Z scintillator material.

Claim 13 (original): The scintillator detector array of claim 1 wherein said first selected scintillator material is LSO and said second selected scintillator material is GSO.

Claim 14 (original): The scintillator detector array of claim 1 wherein said first selected scintillator material is YSO and said second selected scintillation material is LSO.

Claim 15 (original): The scintillator detector array of claim 1 wherein said light guide is active.

Claim 16 (original): The scintillation detector array of Claim 1 wherein said light guide is non-active.

Claim 17 (original): A scintillation detector array for encoding energy, position and time coordinates of gamma ray interactions for use in Positron Emission Tomography imaging, said scintillation detector array comprising:

a plurality of discrete scintillator elements which interact with incident gamma-rays to produce a quantifiable number of scintillation photons, wherein each of said plurality of discrete scintillators is composed of a first layer having a first selected decay time and a second layer having a second selected decay time, wherein said first selected decay time is not equal to said second selected decay time, and further wherein said first and said second layers are composed of High-Z

scintillator materials, and further wherein said first layer is composed of a first selected scintillator material and said second layer is composed of a second selected scintillator material and wherein said first and second selected scintillator materials are stacked one upon the other, whereby a pulse shape discrimination technique is used to determine which said layer the gamma ray interacts;

an optical detector associated with each of said plurality of discrete scintillator elements and positioned for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements;

a continuous light guide having first and second planar surfaces disposed between said plurality of discrete scintillator elements and said associated optical detectors for distributing scintillation photons exiting said plurality of discrete scintillators to said associated optical detectors; and

a means operatively associated with said scintillation detector array for determining time, energy, depth and transverse and longitudinal position coordinates of gamma ray interactions in said plurality of discrete scintillator elements.

Claim 18 (original): The scintillation detector array of Claim 17 wherein said plurality of discrete scintillator elements, which interact with incident gamma-rays to produce a quantifiable number of scintillation photons, is arranged in an (m) x (n) array, and said plurality of optical detectors is arranged in an (q) x (p) array, wherein said plurality of optical detectors is for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements.

Claim 19 (original): The scintillator detector array of claim 18 wherein said (m) x (n) array equals said (q) x (p) array.

Claim 20 (original): The scintillator detector array of claim 18 wherein said (m) x (n) array does not equal said (q) x (p) array.

Claim 21 (original): The scintillator detector array of claim 17 wherein said light guide is active.

Claim 22 (original): The scintillation detector array of Claim 17 wherein said light guide is non-active.

Claim 23 (original): A scintillation detector array for encoding energy, position and time coordinates of gamma ray interactions for use in Positron Emission Tomography imaging, said scintillation detector array comprising:

a plurality of discrete scintillator elements which interact with incident gamma-rays to produce a quantifiable number of scintillation photons, wherein each of said plurality of discrete scintillators is composed of a first layer having a first selected decay time and a second layer having a second selected decay time, wherein said first selected decay time is not equal to said second selected decay time, and further wherein said first and said second layers are composed of High-Z scintillator materials, and further wherein said first layer is composed of a first selected scintillator material and said second layer is composed of a second selected scintillator material and wherein said first and second selected scintillator materials are stacked one upon the other, whereby a pulse shape discrimination technique is used to determine which said layer the gamma ray interacts;

an optical detector associated with each of said plurality of discrete scintillator elements and positioned for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements;

a continuous light guide having first and second planar surfaces optically bonded to said plurality of discrete scintillator elements, whereby said plurality of discrete scintillator elements is disposed between said light guide and said optical detectors, wherein said plurality of discrete scintillator elements distribute

scintillation photons exiting said plurality of discrete scintillators to said associated optical detectors; and

a means operatively associated with said scintillation detector array for determining time, energy, depth and transverse and longitudinal position coordinates of gamma ray interactions in said plurality of discrete scintillator elements.

Claim 24 (original): The scintillation detector array of Claim 23 wherein said plurality of discrete scintillator elements, which interact with incident gamma-rays to produce a quantifiable number of scintillation photons, is arranged in an (m) x (n) array, and said plurality of optical detectors is arranged in an (q) x (p) array, wherein said plurality of optical detectors is for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements.

Claim 25 (original): The scintillator detector array of claim 24 wherein said (m) x (n) array equals said (q) x (p) array.

Claim 26 (original): The scintillator detector array of claim 24 wherein said (m) x (n) array does not equal said (q) x (p) array.

Claim 27 (original): The scintillator detector array of claim 23 wherein said first and said second layer of each of said plurality of discrete scintillator elements is composed of LSO.

Claim 28 (original): The scintillator detector array of claim 23 wherein said High-Z scintillator material is selected from a group consisting of LSO, LYSO, LGSO, GSO, LuAP, and YAP.

Claim 29 (original): The scintillator detector array of claim 23 wherein said first layer is composed of a first selected scintillator material and said second layer is composed of a second selected scintillator material.

Claim 30 (original): The scintillator detector array of claim 29 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for separating low and high energies.

Claim 31 (original): The scintillator detector array of claim 29 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for determining depth of interaction of the gamma rays with said plurality of discrete scintillator elements.

Claim 32 (original): The scintillator detector array of claim 29 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for distinguishing pulse heights of gamma ray interactions.

Claim 33 (original): The scintillator detector array of claim 29 wherein said first selected scintillator material is YSO and said second selected scintillator material is a High-Z scintillator material.

Claim 34 (original): The scintillator detector array of claim 29 wherein said first selected scintillator material is LSO and said second selected scintillator material is GSO.

Claim 35 (original): The scintillator detector array of claim 29 wherein said first selected scintillator material is YSO and said second selected scintillation material is LSO.

Claim 36 (original): The scintillator detector array of claim 23 wherein said light guide is active.

Claim 37 (original): The scintillation detector array of Claim 23 wherein said light guide is non-active.

Claim 38 (original): A scintillation detector array for encoding energy, position and time coordinates of gamma ray interactions for use in Positron Emission Tomography imaging, said scintillation detector array comprising:

a plurality of discrete scintillator elements which interact with incident gamma rays to produce a quantifiable number of scintillation photons, wherein each of said plurality of discrete scintillators is composed of a first layer having a first selected decay time and a second layer having a second selected decay time, wherein said first selected decay time is not equal to said second selected decay time, and further wherein said first layer is composed of a first selected scintillator material and said second layer is composed of a second selected scintillator material and wherein said first and second selected scintillator materials are stacked one upon the other, whereby a pulse shape discrimination technique is used to determine which said layer the gamma ray interacts;

an optical detector associated with each of said plurality of discrete scintillator elements and positioned for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements wherein said plurality of discrete scintillator elements, which interact with incident gamma rays to produce a quantifiable number of scintillation photons, is arranged in an (m) x (n) array, and said plurality of optical detectors is arranged in an (q) x (p) array, wherein said (m) x (n) array does not equal said (q) x (p) array and further wherein said plurality of optical detectors is for sensing and quantifying said scintillation photons exiting each of said plurality of discrete scintillator elements;

a continuous light guide having first and second planar surfaces disposed between said plurality of discrete scintillator elements and said associated optical detectors for distributing scintillation photons exiting said plurality of discrete scintillators to said associated optical detectors; and

a means operatively associated with said scintillation detector array for determining time, energy, depth and transverse and longitudinal position coordinates of gamma ray interactions in said plurality of discrete scintillator elements.

Claim 39 (original): The scintillator detector array of claim 38 wherein said first and said second layers are composed of High Z scintillator materials.

Claim 40 (original): The scintillator detector array of claim 39 wherein said first and said second layer of each of said plurality of discrete scintillator elements is composed of LSO.

Claim 41 (original): The scintillator detector array of claim 39 wherein said High-Z scintillator material is selected from a group consisting of LSO, LYSO, LGSO, GSO, LuAP, and YAP.

Claim 42 (original): The scintillator detector array of claim 39 wherein said first layer is composed of a first selected scintillator material and said second layer is composed of a second selected scintillator material.

Claim 43 (original): The scintillator detector array of claim 42 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for separating low and high energies.

Claim 44 (original): The scintillator detector array of claim 42 wherein said first selected scintillator material and said second selected scintillator material are

selected for use in techniques for determining depth of interaction of the gamma rays with said plurality of discrete scintillator elements.

Claim 45 (original): The scintillator detector array of claim 42 wherein said first selected scintillator material and said second selected scintillator material are selected for use in techniques for distinguishing pulse heights of gamma ray interactions.

Claim 46 (original): The scintillator detector array of claim 38 wherein said first selected scintillator material is YSO and said second selected scintillator material is a High Z scintillator material.

Claim 47 (original): The scintillator detector array of claim 38 wherein said first selected scintillator material is LSO and said second selected scintillator material is GSO.

Claim 48 (original): The scintillator detector array of claim 38 wherein said first selected scintillator material is YSO and said second selected scintillation material is LSO.

Claim 49 (original): The scintillator detector array of claim 38 wherein said light guide is active.

Claim 50 (original): The scintillation detector array of Claim 38 wherein said light guide is non-active.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl No.	:	10/779,596	**Confirmation No.** 8117
Applicant	:	Mark S. Andreaco	
Filed	:	02/13/2004	
TC/A.U.	:	2878	
Examiner	:	Otilia Gabor	
Docket No.	:	24017.03	
Customer No.	:	22465	
Assignee	:	CTI PET Systems, Inc.	
Title	:	Scintillation Detector Array for Encoding the Energy, Position and Time Coordinates of Gamma Ray Interactions	
Express Mail	:	EV 744992887 US	

Mail Stop Appeal Brief—Patents
Commissioner for Patents
P. O. Box 1450
Alexandria VA 22313-1450

APPEAL BRIEF
APPENDIX B—EVIDENCE

Appellants provide no evidence submitted pursuant to 37 CFR §§ 1.120, 1.131 or 1.132. Further, appellants provide no evidence entered by the examiner and relied upon by the appellants in this appeal.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl No.	:	10/779,596	**Confirmation No.** 8117
Applicant	:	Mark S. Andreaco	
Filed	:	02/13/2004	
TC/A.U.	:	2878	
Examiner	:	Otilia Gabor	
Docket No.	:	24017.03	
Customer No.	:	22465	
Assignee	:	CTI PET Systems, Inc.	
Title	:	Scintillation Detector Array for Encoding the Energy, Position and Time Coordinates of Gamma Ray Interactions	
Express Mail	:	EV 744992887 US	

Mail Stop Appeal Brief—Patents
Commissioner for Patents
P. O. Box 1450
Alexandria VA 22313-1450

APPEAL BRIEF
APPENDIX C—RELATED PROCEEDINGS

There are no decisions rendered by a court or the Board in any proceedings identified pursuant to 37 CFR § 41.39(c)(1)(ii).